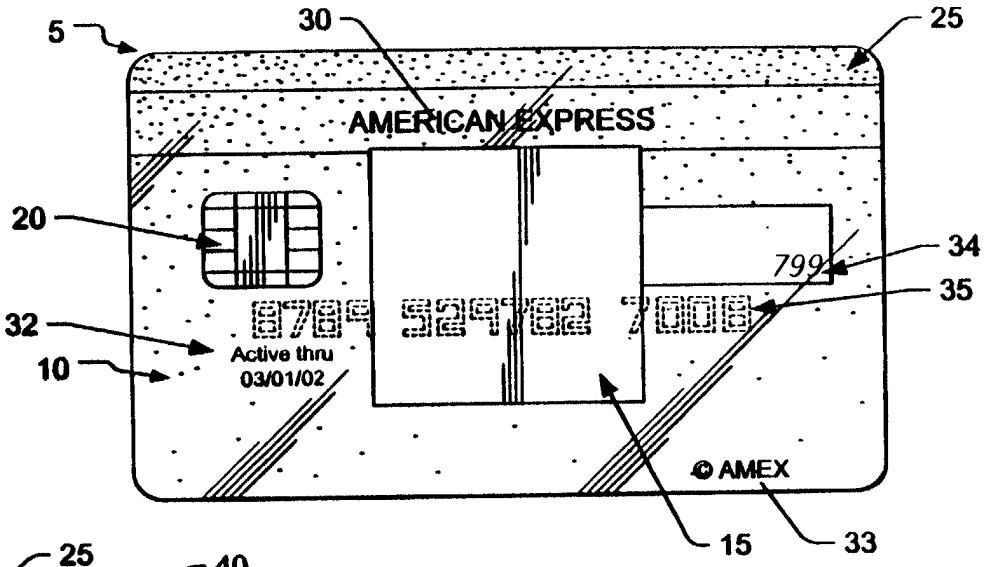
FIG. 1


5
30
25
AMERICAN EXPRESS
20
34
799
35
32
Active thru
03/01/02
10
© AMEX
15
33

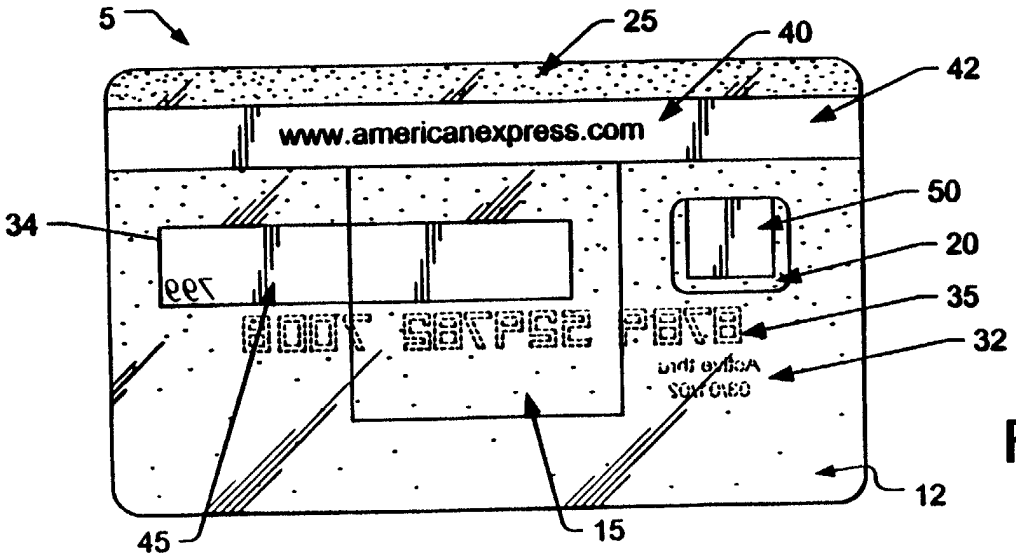

5
25
40
42
www.americanexpress.com
34
50
20
35
32
12
45
15

FIG. 2

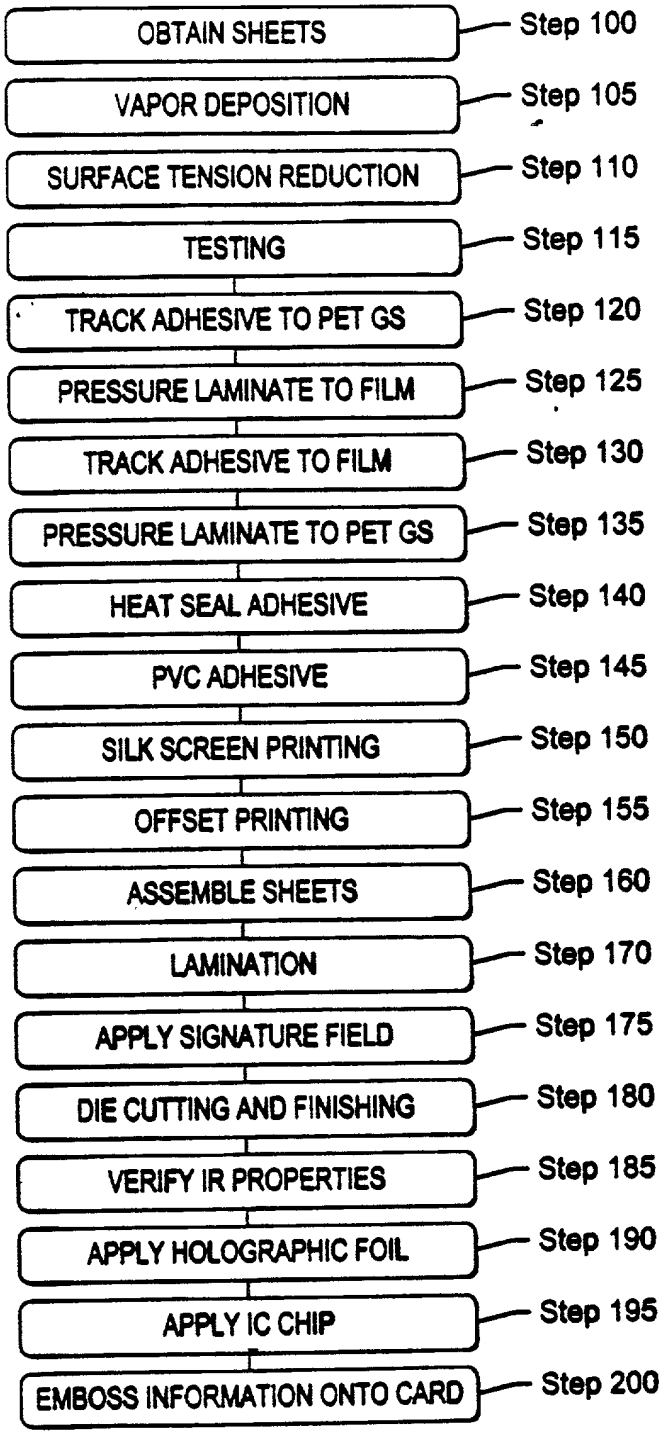

OBTAIN SHEETS
Step 100
VAPOR DEPOSITION
Step 105
SURFACE TENSION REDUCTION
Step 110
TESTING
Step 115
TRACK ADHESIVE TO PET GS
Step 120
PRESSURE LAMINATE TO FILM
Step 125
TRACK ADHESIVE TO FILM
Step 130
PRESSURE LAMINATE TO PET GS
Step 135
HEAT SEAL ADHESIVE
Step 140
PVC ADHESIVE
Step 145
SILK SCREEN PRINTING
Step 150
OFFSET PRINTING
Step 155
ASSEMBLE SHEETS
Step 160
LAMINATION
Step 170
APPLY SIGNATURE FIELD
Step 175
DIE CUTTING AND FINISHING
Step 180
VERIFY IR PROPERTIES
Step 185
APPLY HOLOGRAPHIC FOIL
Step 190
APPLY IC CHIP
Step 195
EMBOSS INFORMATION ONTO CARD
Step 200

FIG. 3

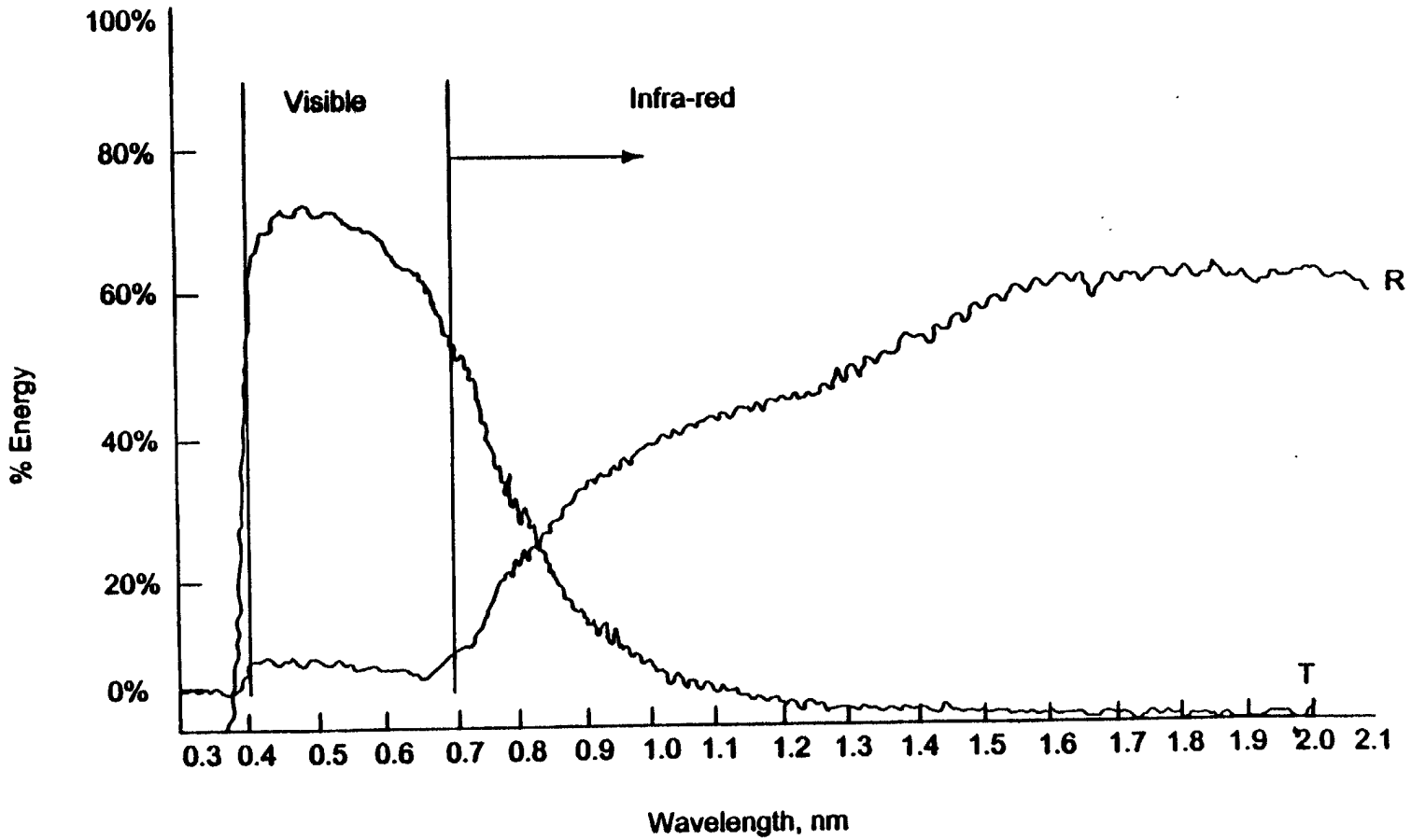


FIG. 4

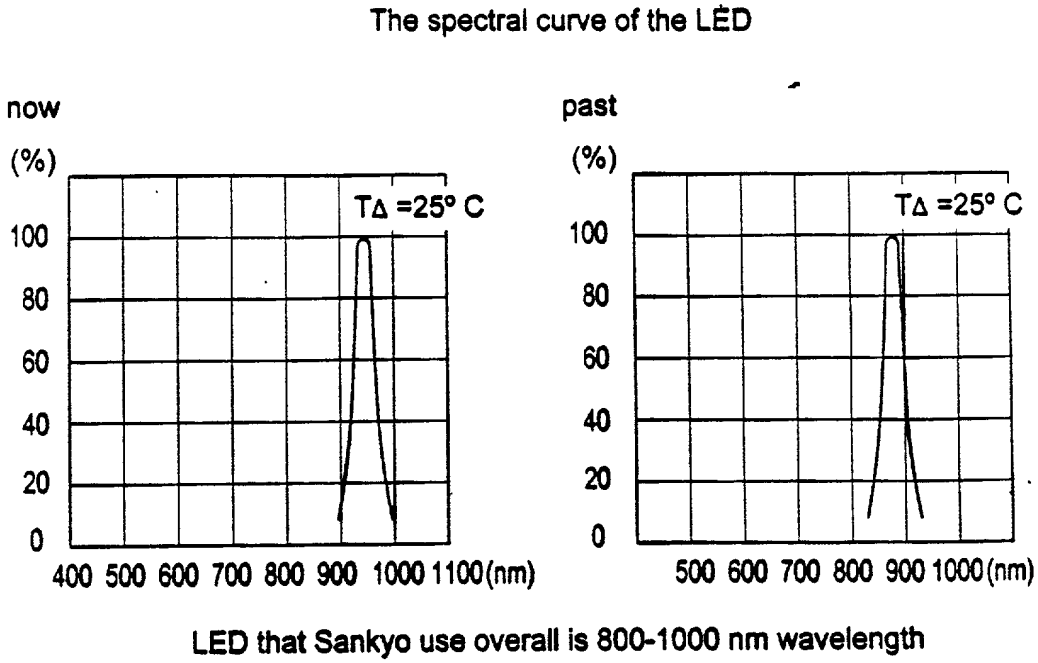

The spectral curve of the LED
now
(%)
TΔ =25° C
100
80
60
40
20
0
400 500 600 700 800 900 1000 1100(nm)
past
(%)
TΔ =25° C
100
80
60
40
20
0
500 600 700 800 900 1000(nm)
LED that Sankyo use overall is 800-1000 nm wavelength

FIG. 5

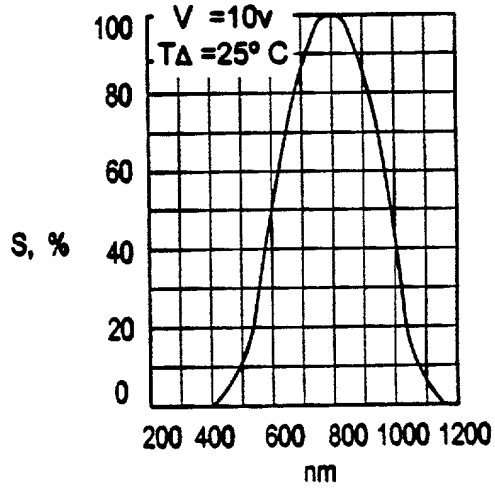
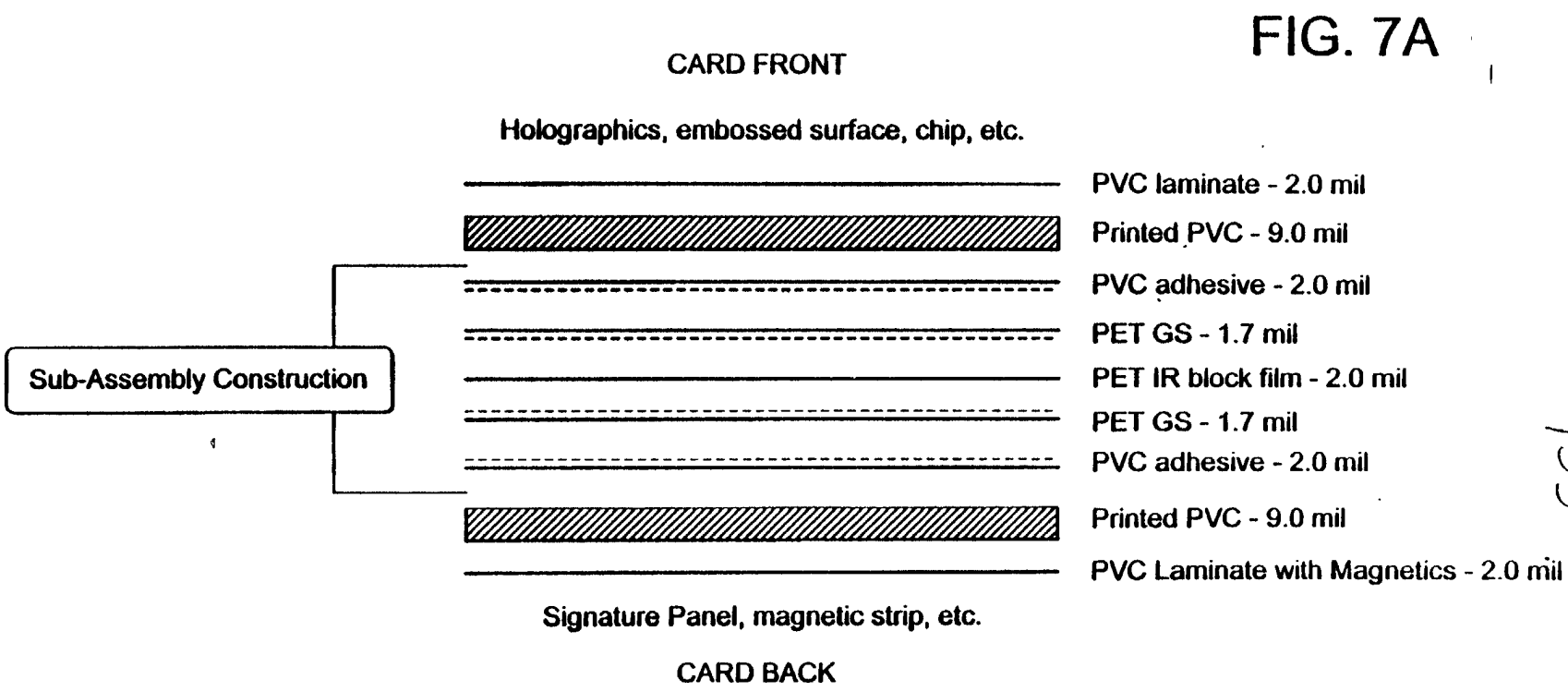

V =10v
TΔ =25° C
100
80
60
S, %
40
20
0
200 400 600 800 1000 1200
nm

FIG. 6

FIG. 7A


CARD FRONT
Holographics, embossed surface, chip, etc.
PVC laminate - 2.0 mil
Printed PVC - 9.0 mil
PVC adhesive - 2.0 mil
PET GS - 1.7 mil
Sub-Assembly Construction
PET IR block film - 2.0 mil
PET GS - 1.7 mil
PVC adhesive - 2.0 mil
Printed PVC - 9.0 mil
PVC Laminate with Magnetics - 2.0 mil
Signature Panel, magnetic strip, etc.
CARD BACK

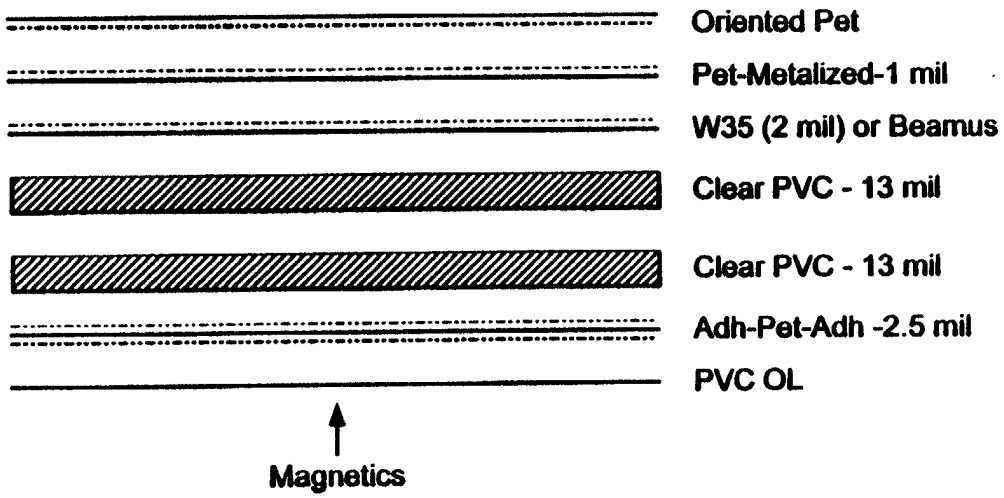

Oriented Pet
Pet-Metalized-1 mil
W35 (2 mil) or Beamus
Clear PVC - 13 mil
Clear PVC - 13 mil
Adh-Pet-Adh -2.5 mil
PVC OL
Magnetics

FIG. 7B

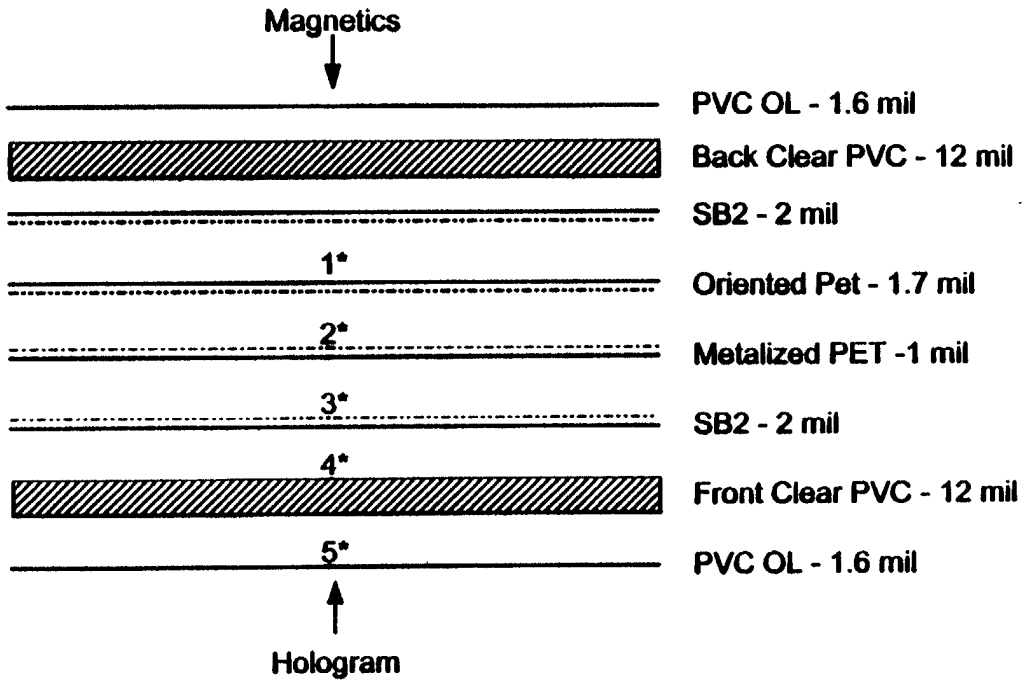

Magnetics
PVC OL - 1.6 mil
Back Clear PVC - 12 mil
SB2 - 2 mil
1*
Oriented Pet - 1.7 mil
2*
Metalized PET -1 mil
3*
SB2 - 2 mil
4*
Front Clear PVC - 12 mil
5*
PVC OL - 1.6 mil
Hologram

FIG. 7C

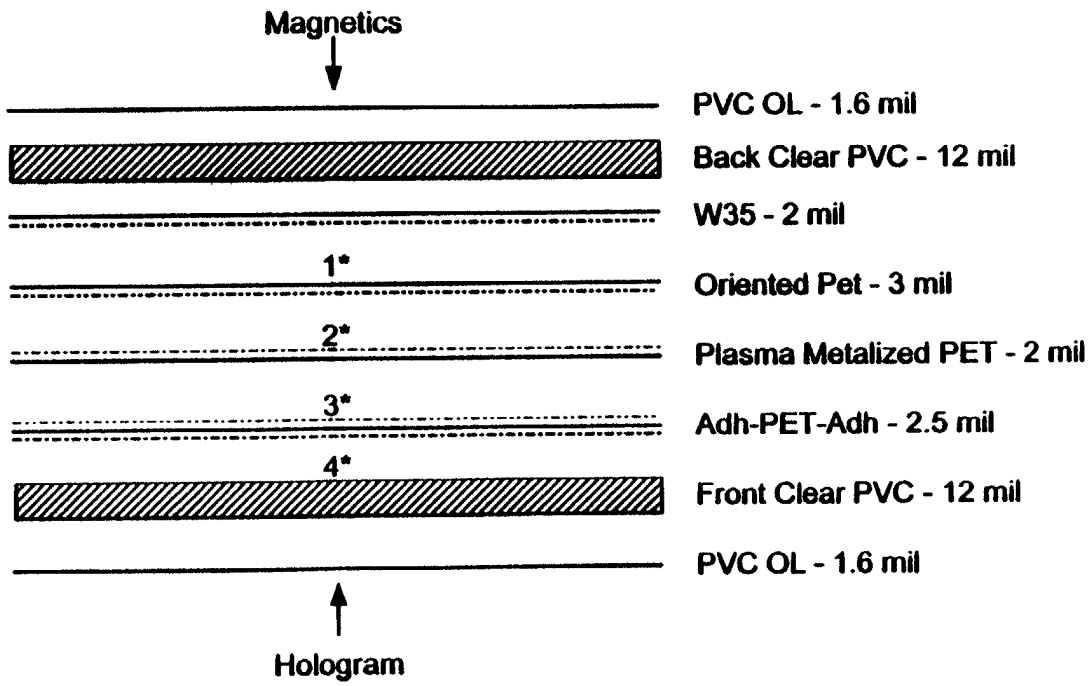

Magnetics
PVC OL - 1.6 mil
Back Clear PVC - 12 mil
W35 - 2 mil
1*
Oriented Pet - 3 mil
2*
Plasma Metalized PET - 2 mil
3*
Adh-PET-Adh - 2.5 mil
4*
Front Clear PVC - 12 mil
PVC OL - 1.6 mil
Hologram

FIG. 7D

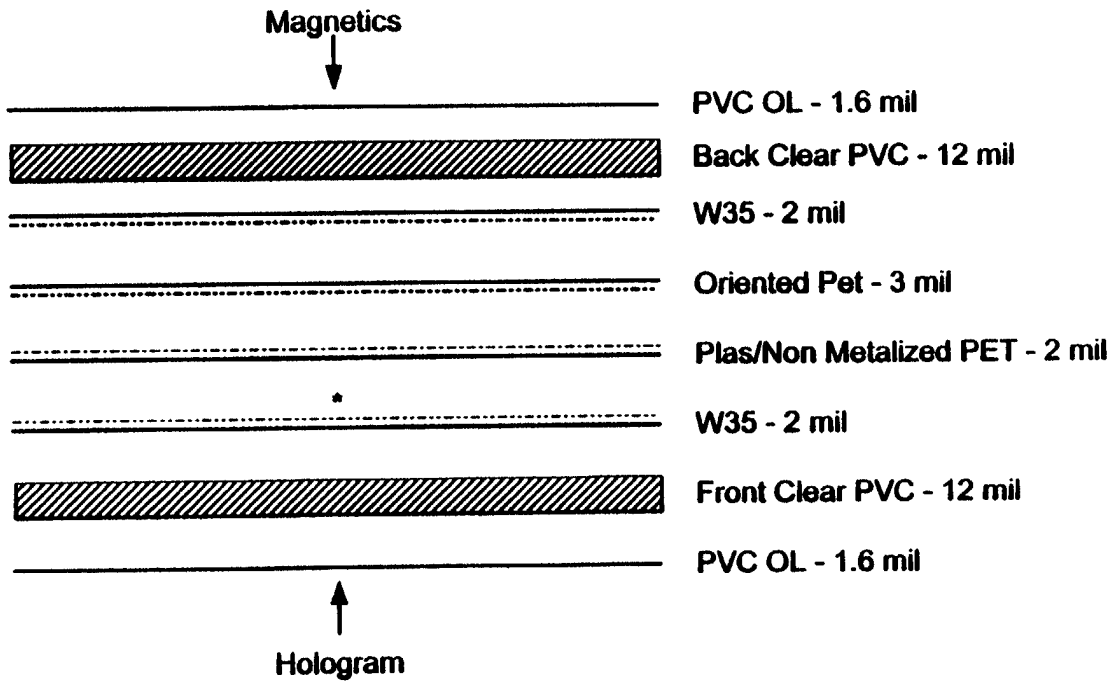

Magnetics
PVC OL - 1.6 mil
Back Clear PVC - 12 mil
W35 - 2 mil
Oriented Pet - 3 mil
Plas/Non Metalized PET - 2 mil
W35 - 2 mil
Front Clear PVC - 12 mil
PVC OL - 1.6 mil
Hologram

FIG. 7E

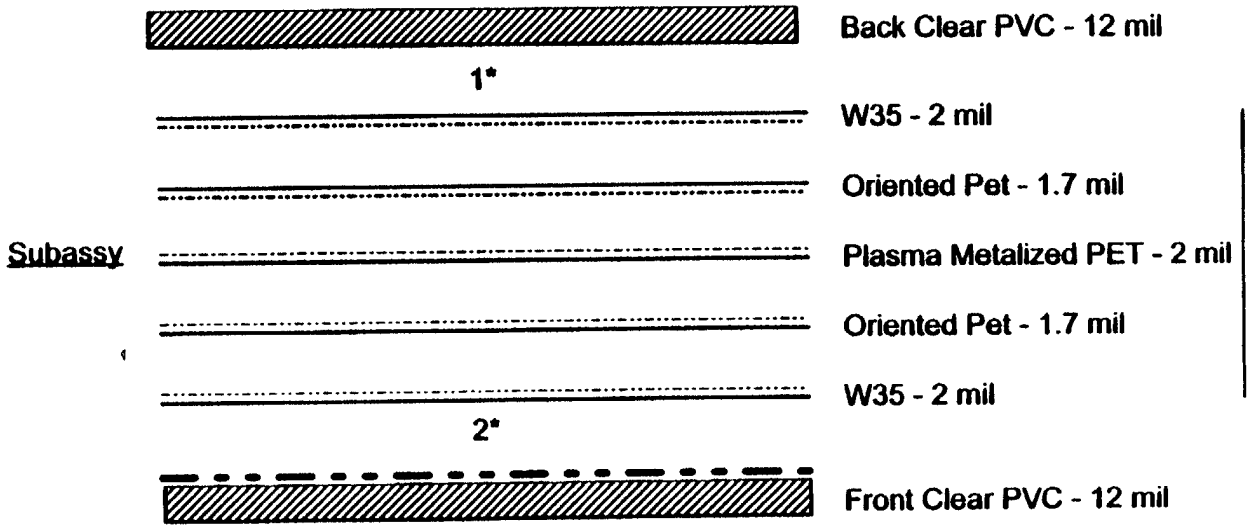

Back Clear PVC - 12 mil
1*
W35 - 2 mil
Oriented Pet - 1.7 mil
Subassy
Plasma Metalized PET - 2 mil
Oriented Pet - 1.7 mil
W35 - 2 mil
2*
Front Clear PVC - 12 mil

FIG. 7F

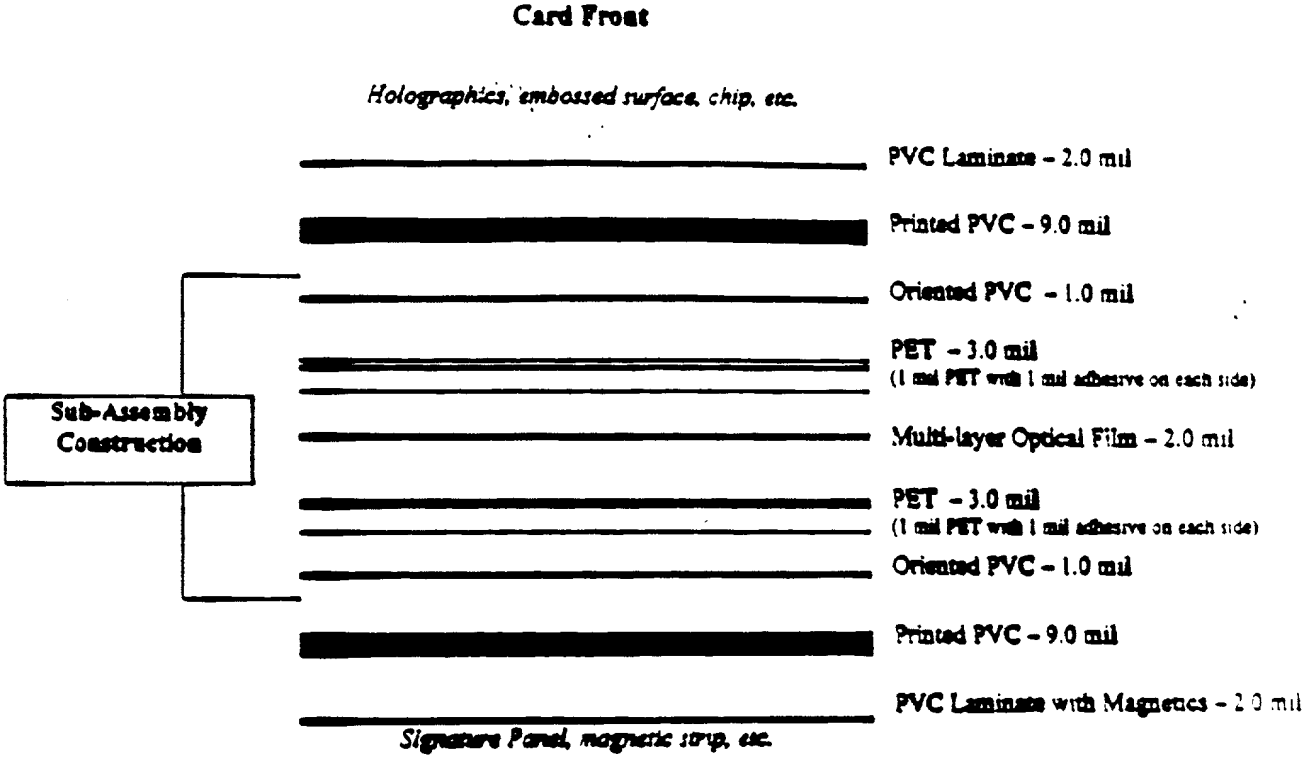

Card Front
Holographics, embossed surface, chip, etc.
PVC Laminate – 2.0 mil
Printed PVC – 9.0 mil
Oriented PVC – 1.0 mil
PET – 3.0 mil
(1 mil PET with 1 mil adhesive on each side)
Sub-Assembly Construction
Multi-layer Optical Film – 2.0 mil
PET – 3.0 mil
(1 mil PET with 1 mil adhesive on each side)
Oriented PVC – 1.0 mil
Printed PVC – 9.0 mil
PVC Laminate with Magnetics – 2.0 mil
Signature Panel, magnetic strip, etc.

FIGURE 7G

Card Front

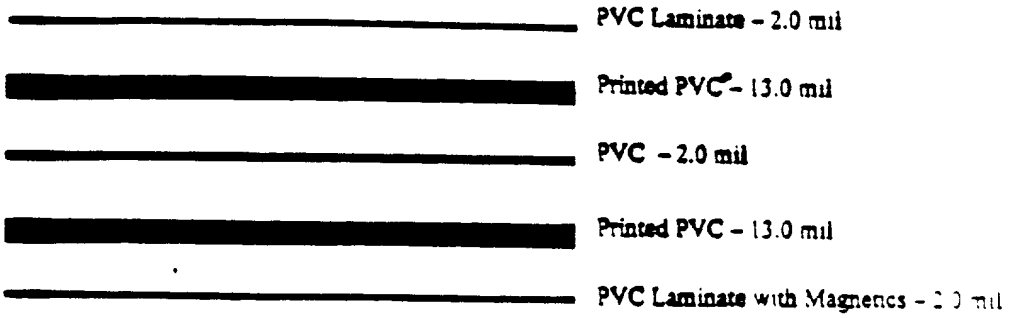


FIGURE 7H

Card Front

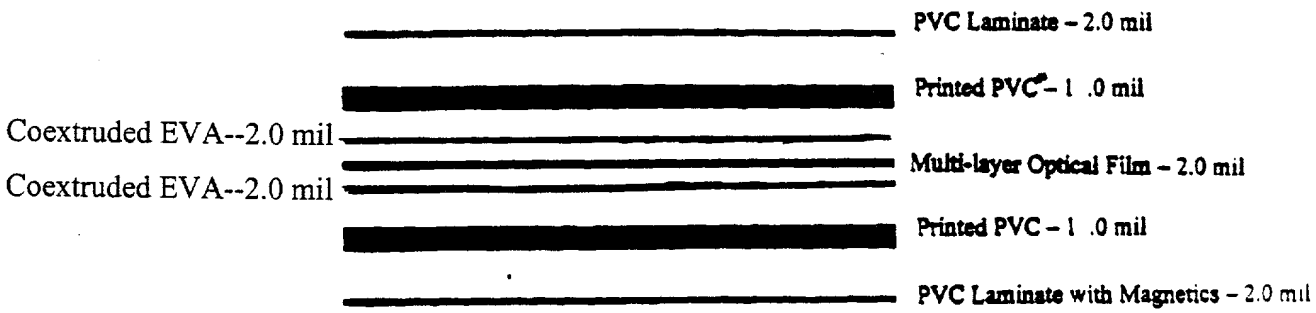


FIGURE 7I

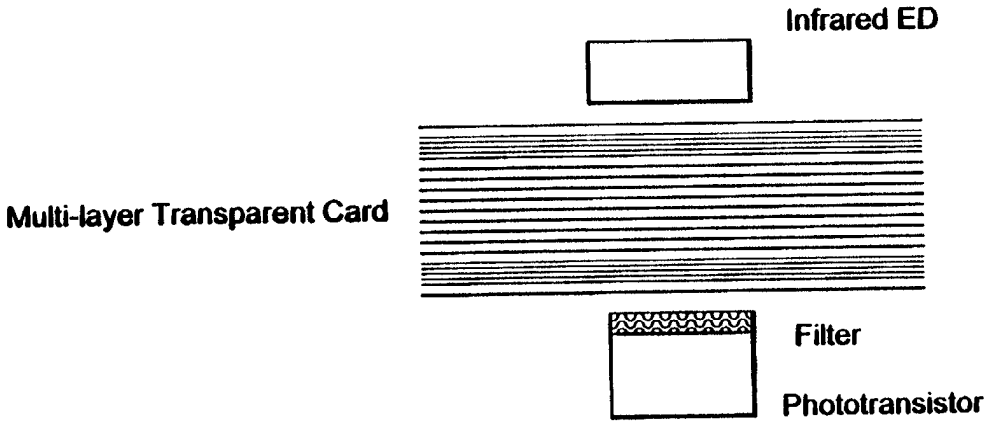


FIG. 8

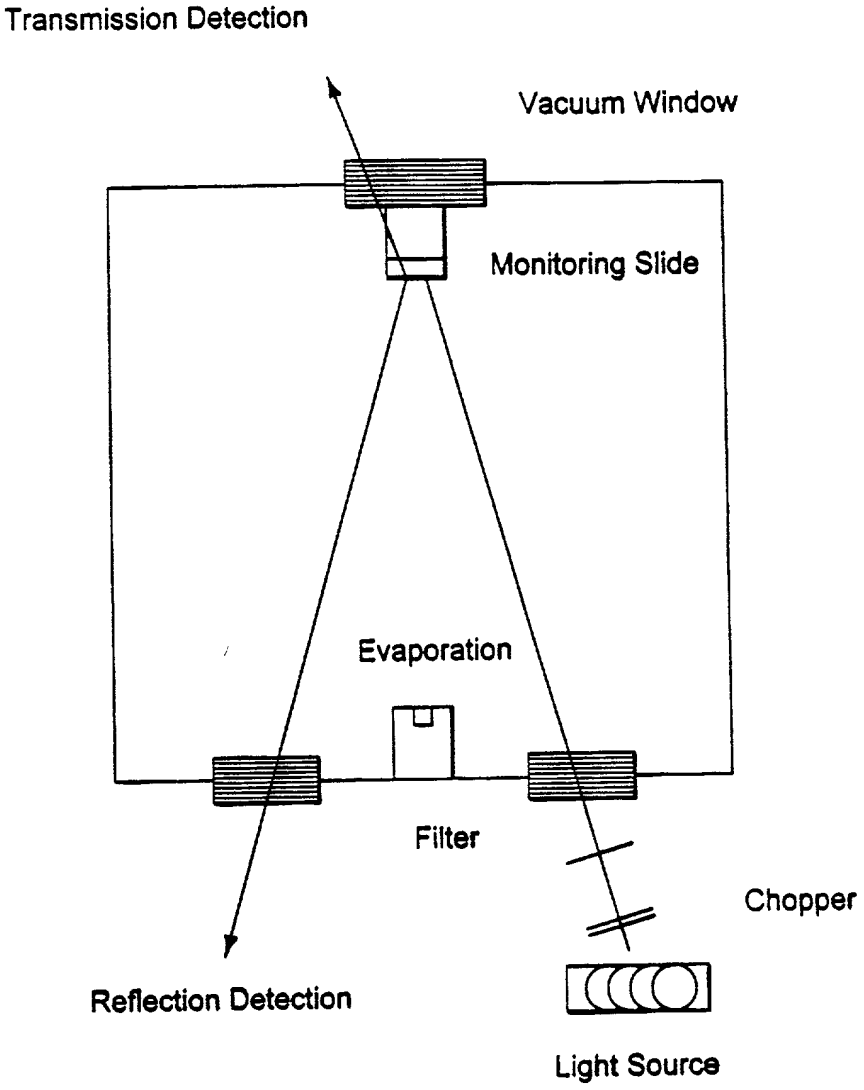

Transmission Detection
Vacuum Window
Monitoring Slide
Evaporation
Filter
Chopper
Reflection Detection
Light Source

FIG. 9

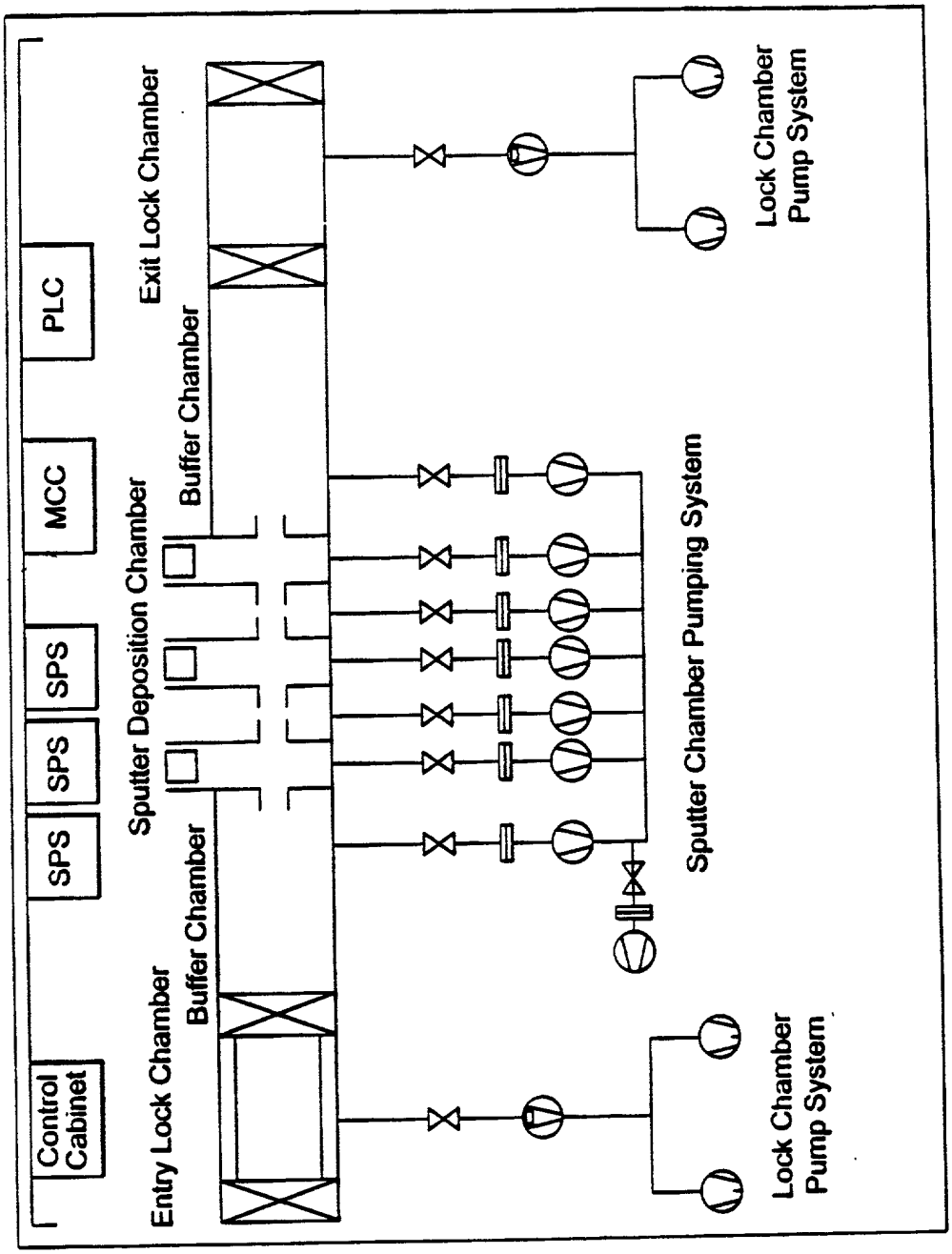

Control Cabinet
SPS
SPS
SPS
MCC
PLC
Entry Lock Chamber
Buffer Chamber
Sputter Deposition Chamber
Buffer Chamber
Exit Lock Chamber
Sputter Chamber Pumping System
Lock Chamber Pump System
Lock Chamber Pump System

FIG. 10

Number	Material	Specifications	Source	Comments
	Construction 1 - white needs work, lamination temperature too low, pvc core bond low.			
1	pvc laminate	1.60	oberthur	front 4:1,4.4; back 4.0,4.0
2	pet adhesive both sides	2.50	allied signal	
3	printed core - white #1	12.00	oberthur	
4	printed core - white #1	12.00	oberthur	
5	wl-35 pvc (adh to xir)	2.00	klockner	
6	xir (metal to pet gs)	1.00	southwall	
7	pet glue/stamp	1.70	d & k	1.2 mil adhesive, 0.5 mil pet.
Total		32.80		thickness .030-.031
	Construction 2			
1	pvc laminate	1.60	oberthur	
2	pet adhesive both sides	2.50	allied signal	
3	printed core	12.00	oberthur	
4	printed core	12.00	oberthur	
5	wl-35 pvc (adh to xir)	2.00	klockner	
6	xir (metal to pet gs)	1.00	southwall	
7	pet glue/stamp (adh to xir)	1.70	d & k	1.2 mil adhesive, 0.5 mil pet.
8	wl-35 pvc (adh to pet)	2.00	klockner	
Total		34.80		
	Construction 3			
1	pvc laminate	1.60	oberthur	
2	pet adhesive both sides	2.50	allied signal	
3	printed core	12.00	oberthur	
4	printed core	12.00	oberthur	
5	wl-35 pvc (adh to xir)	2.00	klockner	
6	xir (metal to pet gs)	1.00	southwall	
7	pet glue/stamp (adh to xir)	1.70	d & k	1.2 mil adhesive, 0.5 mil pet.
8	gomar pvc (adh to pet)	2.00	allied signal	
Total		34.80		
	Construction 4 - white #2 too dark, temperature too low, pvc lamination bond low			
1	pvc laminate	1.60	oberthur	front - 4.0, 4.3; back tear
2	pet adhesive both sides	2.50	allied signal	
3	printed core - white #2	12.00	oberthur	
4	printed core - white #2	12.00	oberthur	
5	bemis (adh to xir)	2.00	klockner	
6	xir (metal to pet gs)	1.00	southwall	
7	pet glue/stamp	1.70	d & k	1.2 mil adhesive, 0.5 mil pet.
Total		32.80		thickness .030 - .031
	Construction 5 - white #3 too dark, temperature too low - pvc lamination bond low			
1	pvc laminate	1.60	oberthur	
2	pet adhesive both sides	2.50	allied signal	
3	printed core - white #3	12.00	oberthur	
4	printed core - white #3	12.00	oberthur	
5	w-35 (adh to xir pet)	2.00	klockner	
6	xir (metal to pet gs)	1.00	southwall	
7	pet glue/stamp	1.70	d & k	1.2 mil adhesive, 0.5 mil pet.
	Total	32.80		thickness .030 - .031
	howard 1.0 coating			
1	neocryl b725	33.60	zeneca?	
2	EtOH	31.20		
3	nPOAc	31.20		

FIG. 11

4 citraflex a4	4.00	moreslip, greensboro	
Total	100.00		
Construction #6 - seems to stick ok, best so far, scale up. Make sub-laminat (aka - s)			
1 pvc laminate	1.60	oberthur	
2 core pvc	12.00	oberthur	
3 bemis	2.00	bemis	
4 petgs	1.70	d & k	
5 xir (metal to pet gs)	1.00	southwall	plasma treated
6 bemis	2.00	bemis	
7 core pvc	12.00	oberthur	
8 pvc laminate	1.60	oberthur	magnetics
Total	33.90		
herslow sublamination			
Total Price			
Construction #7 - seems to stick ok, best so far, scale up. Make sub-laminat (aka - t)			
1 pvc laminate	1.60	oberthur	
2 core pvc	12.00	oberthur	
3 w-35	2.00	bemis	
4 petgs	1.70	d & k	
5 xir (metal to pet gs)	1.00	southwall	plasma treated
6 bemis	2.00	bemis	
7 core pvc	12.00	oberthur	
8 pvc laminate	1.60	oberthur	magnetics
Total	33.90		
Construction #7 - seems to stick ok, best so far, scale up. Make sub-laminat (aka - t)			
1 pvc laminate	1.60	oberthur	
2 core pvc	12.00	oberthur	
3 w-35	2.00	bemis	
4 petgs	1.70	d & k	
5 xir (metal to pet gs)	1.00	southwall	plasma treated
6 w-35	2.00	bemis	
7 core pvc	12.00	oberthur	core to core = 14.2 lb.in.
8 pvc laminate	1.60	oberthur	magnetics
Total	33.90		
Construction #8 - sublaminate to be used with 12 mil pvc core			
1 w-35	2.00		
2 petgs	1.70		
3 xir (metal to pet gs)	1.00		
Total	4.70		
Construction #9 - sublaminate to be used with 10 mil pvc core			
1 pvc laminate	1.60		
2 w-35	2.00		
3 petgs	1.70		
4 xir (metal to pet gs)	1.00		
5 bemis	2.00		
6 pvc laminate	1.60		
Total	9.90		
Construction #10 (if u works)			
1 w35	2.00		
2 petgs	1.70		
3 xir (metal to pet gs)	1.00		
4 w35	2.00		

FIG. 11
continued

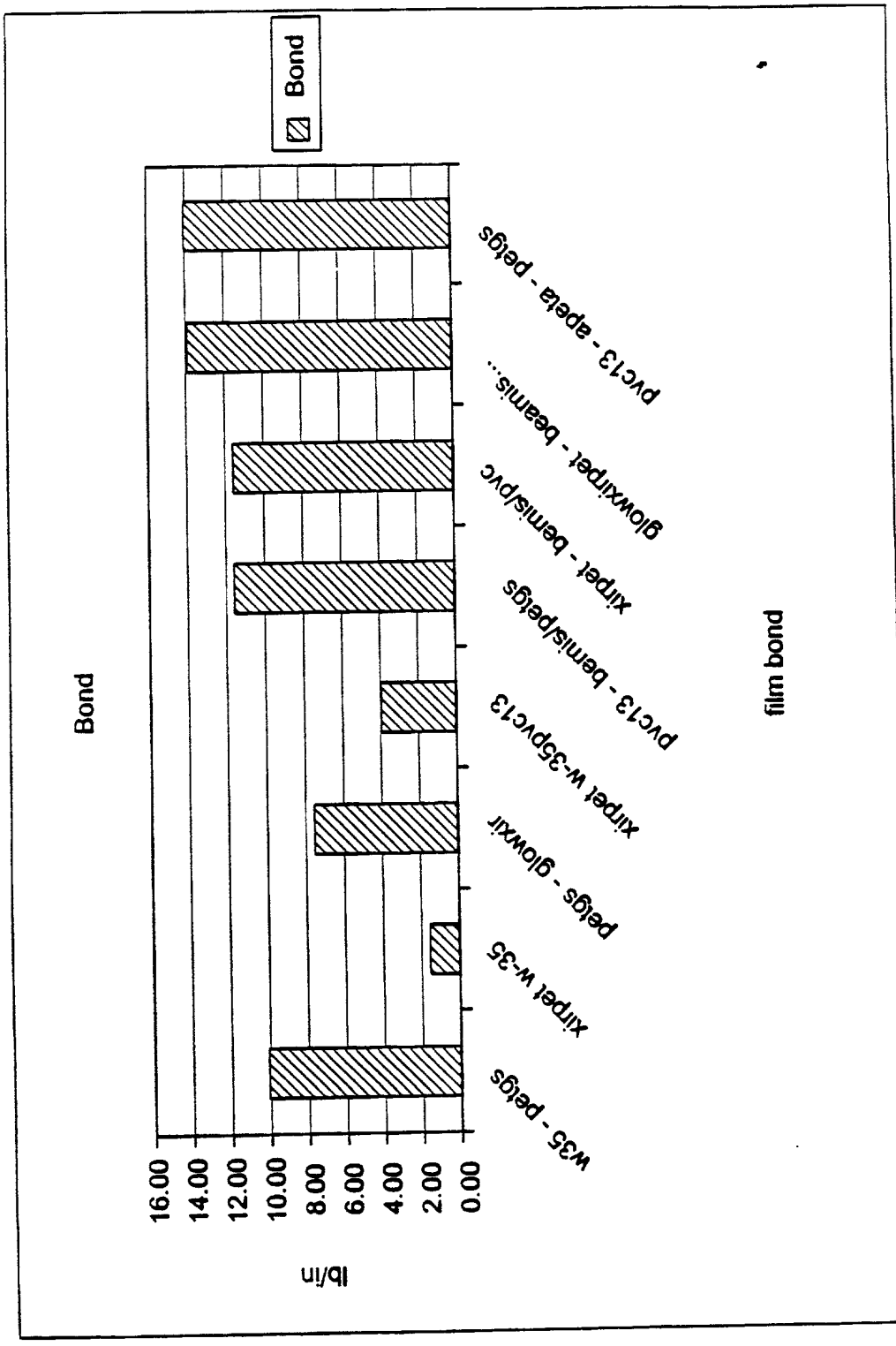

Bond
Bond
lb/in
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
w35 - pelgs
xirpel w-35
pelgs - glowxir
xirpel w-35pvc13
pvc13 - bemis/pelgs
xirpel - bemis/pvc
glowxirpel - beamis...
pvc13 - apela - pelgs
film bond

FIG. 12A

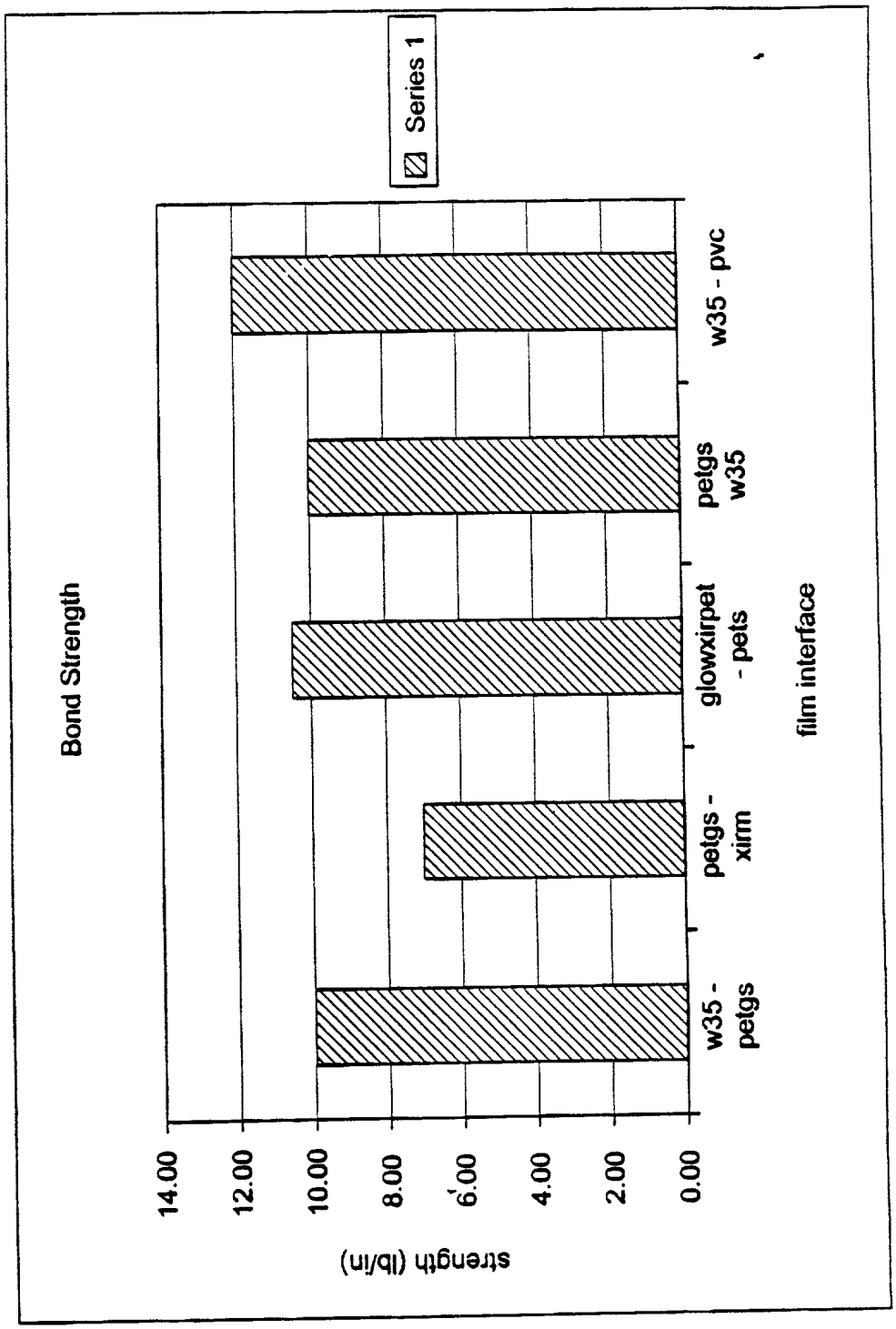

Bond Strength
Series 1
strength (lb/in)
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
w35 - petgs
petgs - xirm
glowxirpet - pets
petgs w35
w35 - pvc
film interface

FIG. 12B

Total	6.70	
ir ink - printed core		
1 tm mixing clear	0.80	sericol
2 vmca resin	0.07	union carbide
3 cyclohexanone	0.10	aldrich
4 epolight vii-164	0.03	epolin
Total	1.00	
ir ink #2		
1 vinyl vmca resin	0.55	union carbide
2 eep solvent	0.35	eastman kodak
3 cyclohexanone	0.05	aldrich
4 epolight vii-164	0.03	epolin
5 epolight vi-30	0.02	epolin
Total	1.00	
ir ink #3		
1 tm mixing clear	0.90	sericol
2 cyclohexanone	0.03	aldrich
3 epolight vii-164	0.03	epolin
4 epolight vi-30	0.02	epolin
5 epolight 6084	0.02	epolin
Total	1.00	

FIG. 13

Green Card Measurements

Wavelength	Transmission Density	ATM Readability	ISO Compliant
400 to 470	1.5 to 2.4	Yes	Yes
470 to 640	1.3 to 0.9	Yes	No
640 to 780	1.3 to 2.5	Yes	Yes
780 to 800	1.3 to 1.2	Yes	Borderline
800 to 1000	1.3 to 2.6	Yes	Yes

FIG. 14

Green RCP ATM Test Results

ATM Manufacturer	Equipment Type	Notes	Global Platform	Pass/Fail
NCR Corporation	15 NCR ATMs 6 Diebold ATMs	Diagnostic and Application tested	Yes	Pass
Diebold	202 and 861 (Universal) Series and Kyoto series (made by Omron)	Diebold require opacity of greater than 1.3 from 700nm plus for acceptance in all Diebold machines	Yes	Pass
Fujitsu	5 ATMs with motorized track, motorized track 2 and dip readers	ATM configuration included card reader firmware for card detection,	Yes (except Japan)	Pass

FIG. 15

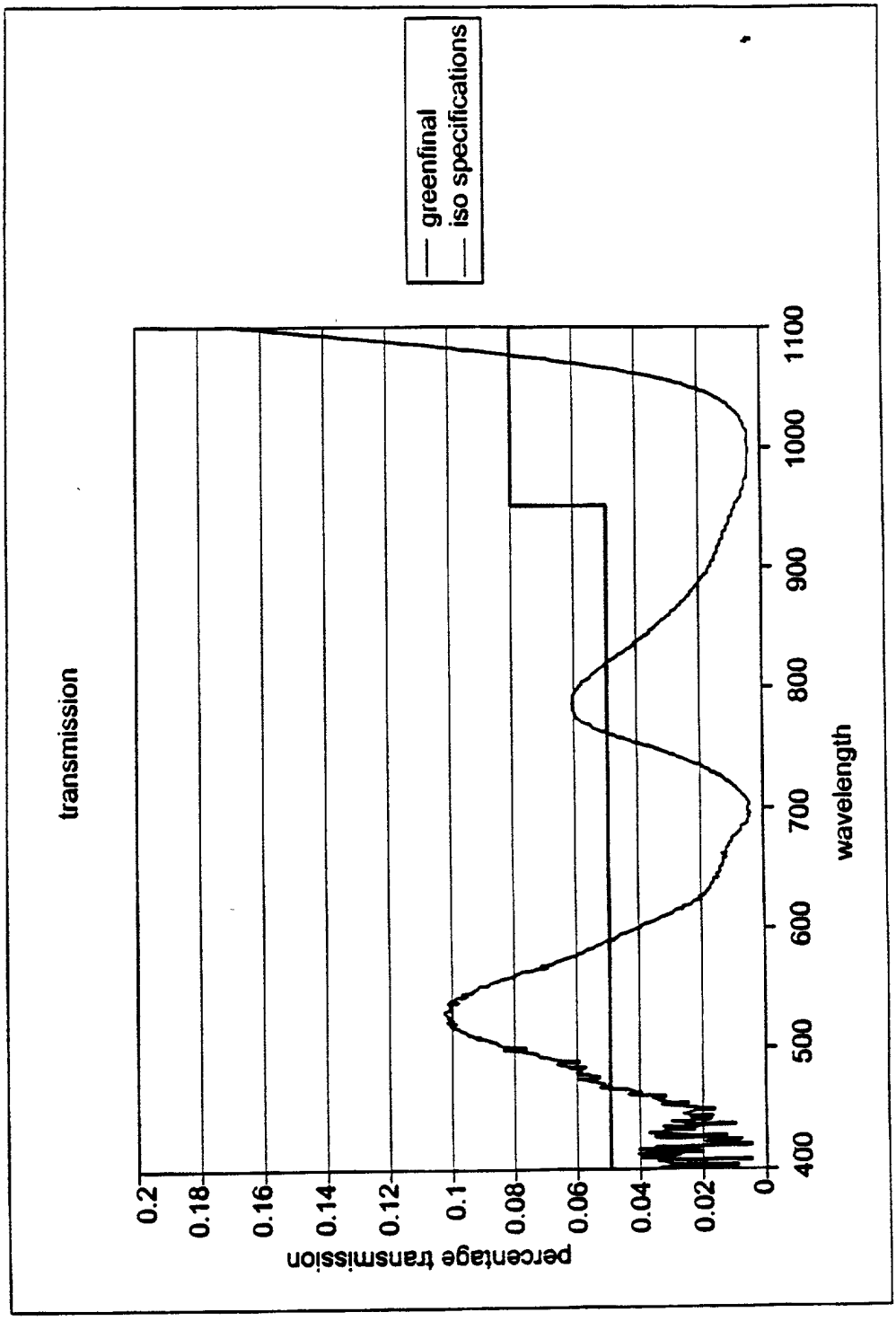

transmission
greenfinal
iso specifications
percentage transmission
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
400
500
600
700
800
900
1000
1100
wavelength

FIG. 16

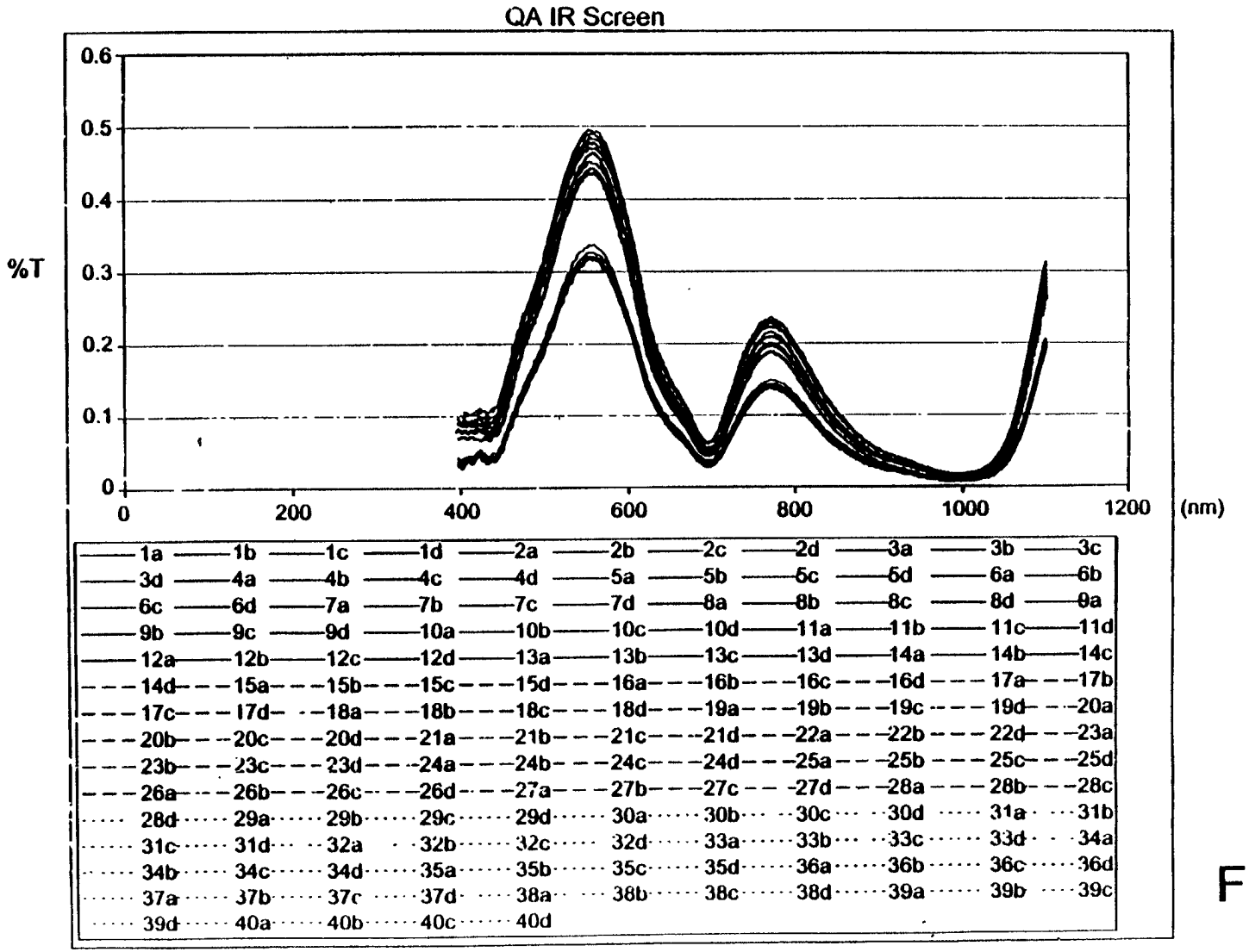

QA IR Screen
%T
0.6
0.5
0.4
0.3
0.2
0.1
0
0
200
400
600
800
1000
1200
(nm)
1a 1b 1c 1d 2a 2b 2c 2d 3a 3b 3c
3d 4a 4b 4c 4d 5a 5b 5c 5d 6a 6b
6c 6d 7a 7b 7c 7d 8a 8b 8c 8d 9a
9b 9c 9d 10a 10b 10c 10d 11a 11b 11c 11d
12a 12b 12c 12d 13a 13b 13c 13d 14a 14b 14c
14d 15a 15b 15c 15d 16a 16b 16c 16d 17a 17b
17c 17d 18a 18b 18c 18d 19a 19b 19c 19d 20a
20b 20c 20d 21a 21b 21c 21d 22a 22b 22d 23a
23b 23c 23d 24a 24b 24c 24d 25a 25b 25c 25d
26a 26b 26c 26d 27a 27b 27c 27d 28a 28b 28c
28d 29a 29b 29c 29d 30a 30b 30c 30d 31a 31b
31c 31d 32a 32b 32c 32d 33a 33b 33c 33d 34a
34b 34c 34d 35a 35b 35c 35d 36a 36b 36c 36d
37a 37b 37c 37d 38a 38b 38c 38d 39a 39b 39c
39d 40a 40b 40c 40d

FIG. 17A

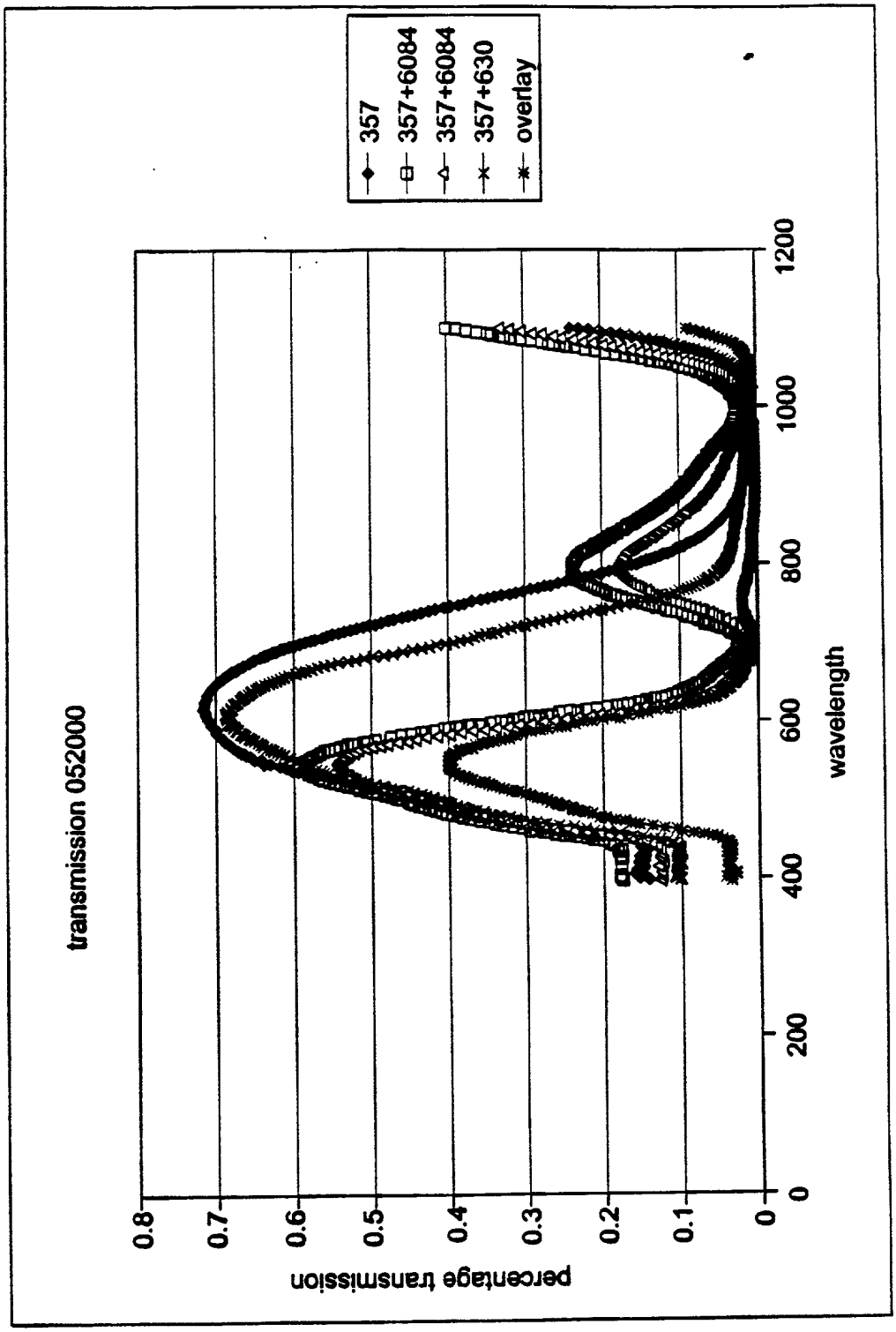

transmission 052000
357
357+6084
357+6084
357+630
overlay
percentage transmission
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
200
400
600
800
1000
1200
wavelength

FIG. 17B

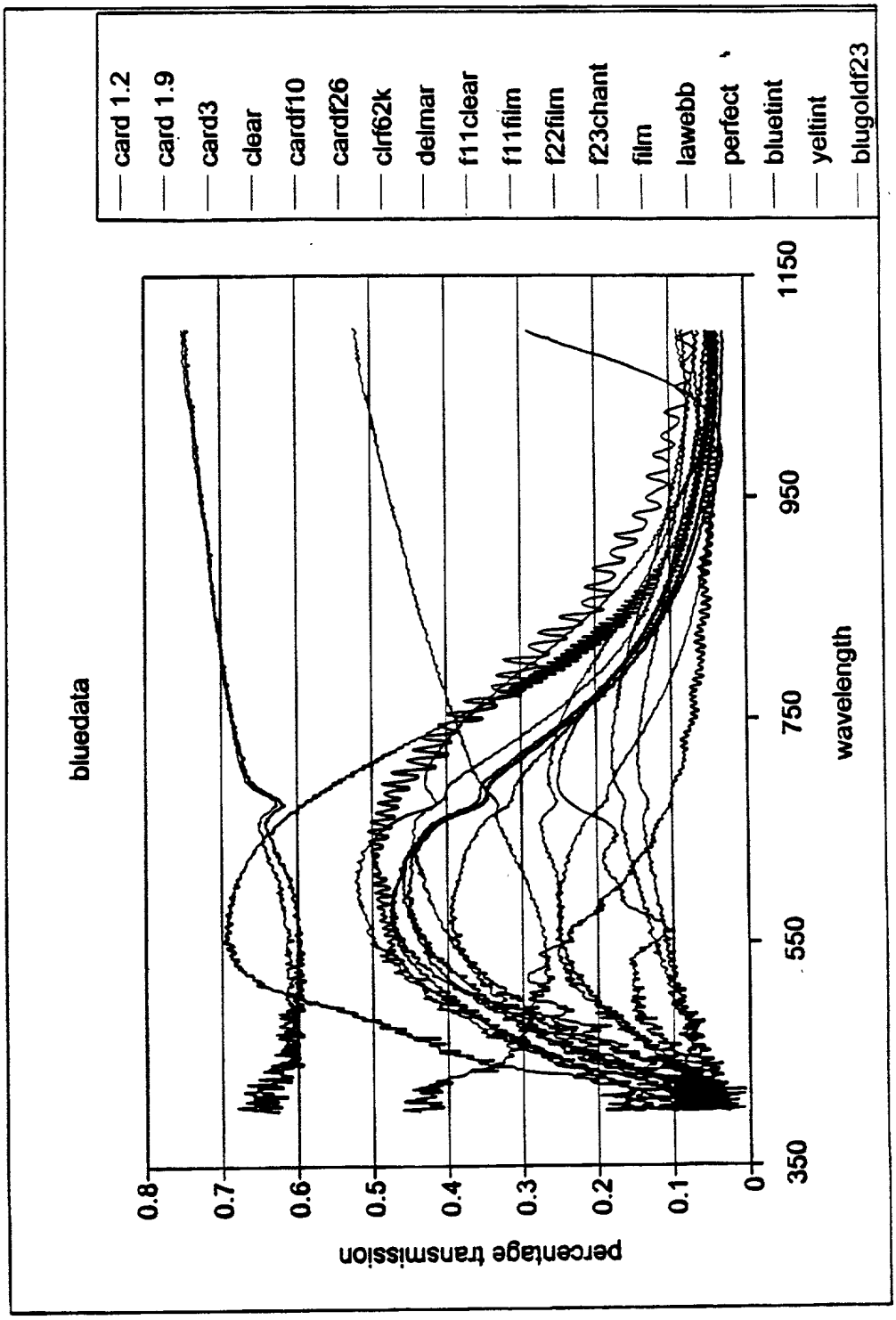

bluedata
percentage transmission
wavelength
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
350
550
750
950
1150
card 1.2
card 1.9
card3
clear
cardf10
cardf26
clrf62k
delmar
f11clear
f11film
f22film
f23chant
film
lawebb
perfect
bluetint
yeltint
blugoldf23

FIG. 17C

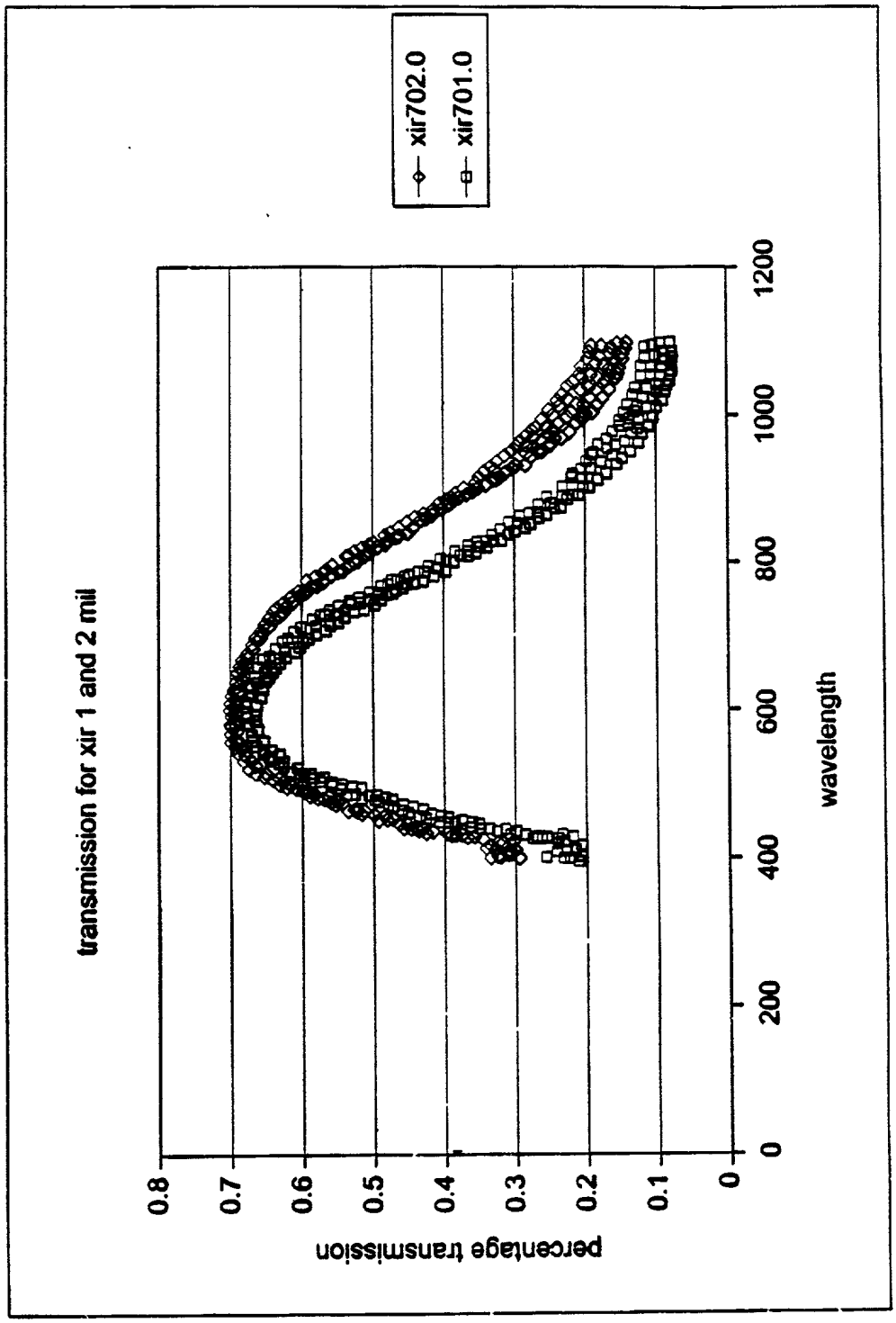

transmission for xir 1 and 2 mil
xir702.0
xir701.0
percentage transmission
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
200
400
600
800
1000
1200
wavelength

FIG. 17D

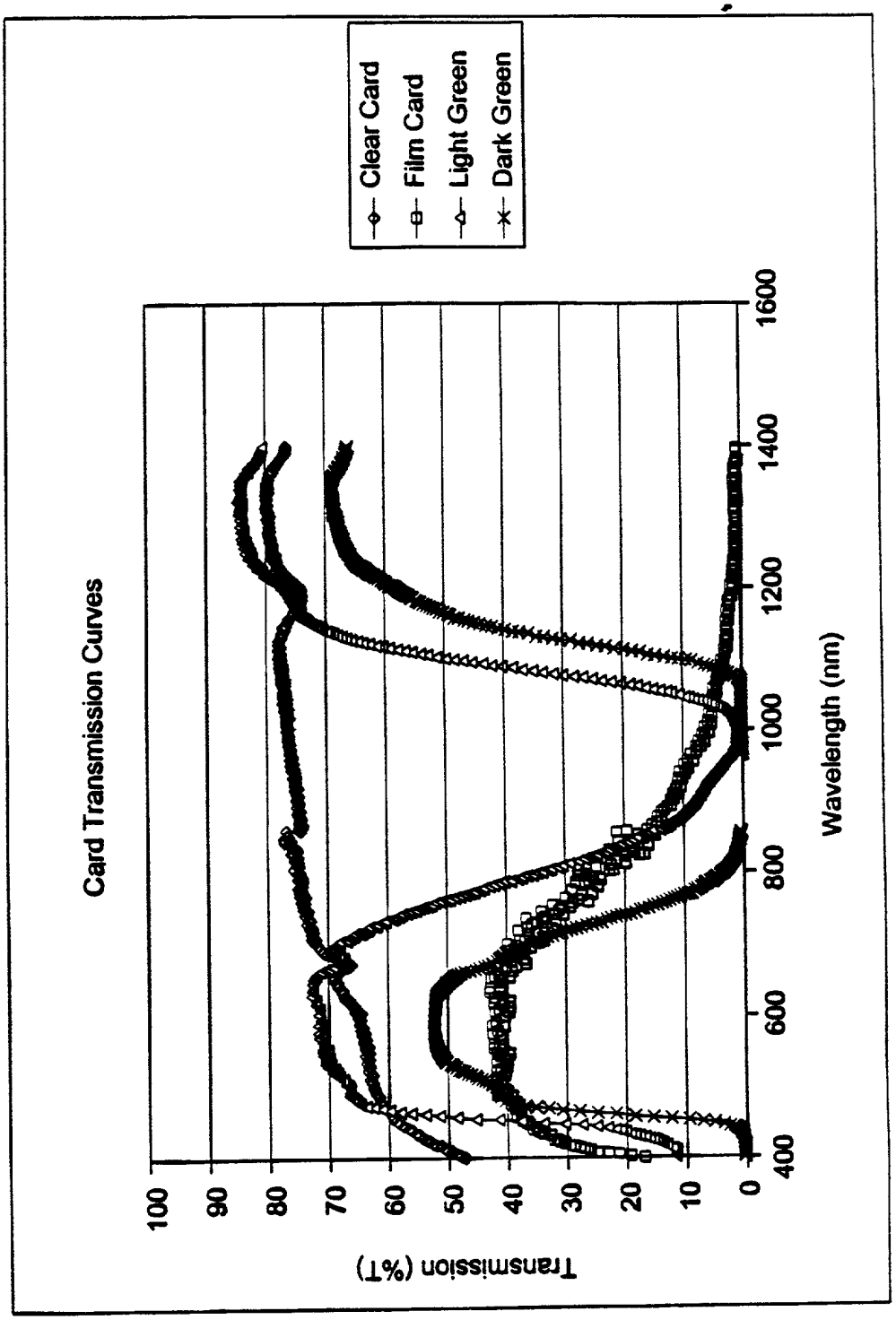

Card Transmission Curves
Clear Card
Film Card
Light Green
Dark Green
Transmission (%T)
100
90
80
70
60
50
40
30
20
10
0
400
600
800
1000
1200
1400
1600
Wavelength (nm)

FIG. 17E

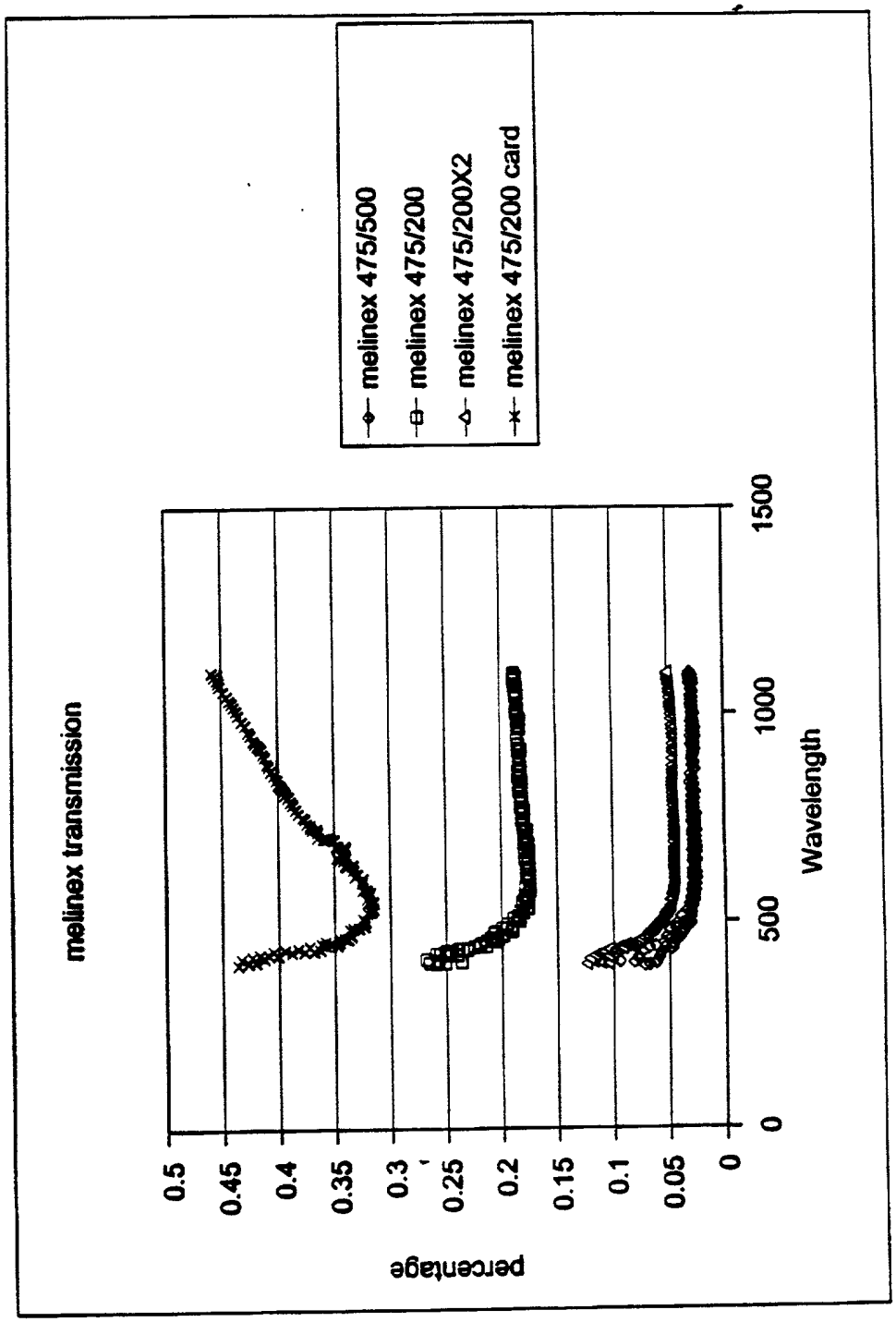

melinex transmission
melinex 475/500
melinex 475/200
melinex 475/200X2
melinex 475/200 card
percentage
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
0
500
1000
1500
Wavelength

FIG. 17F

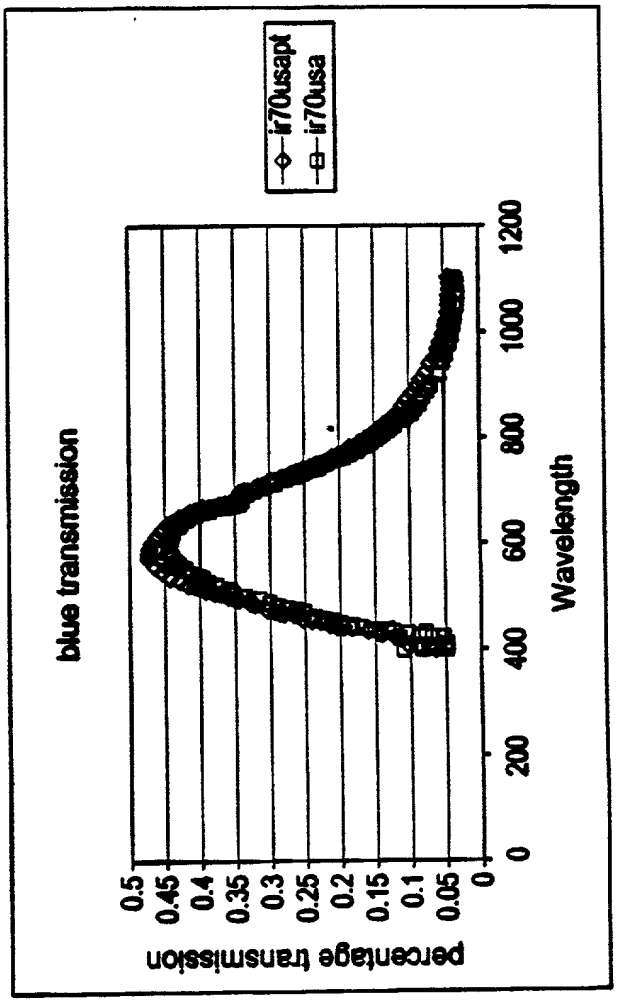

blue transmission
ir70usapt
ir70usa
percentage transmission
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
0
200
400
600
800
1000
1200
Wavelength

FIG. 17G

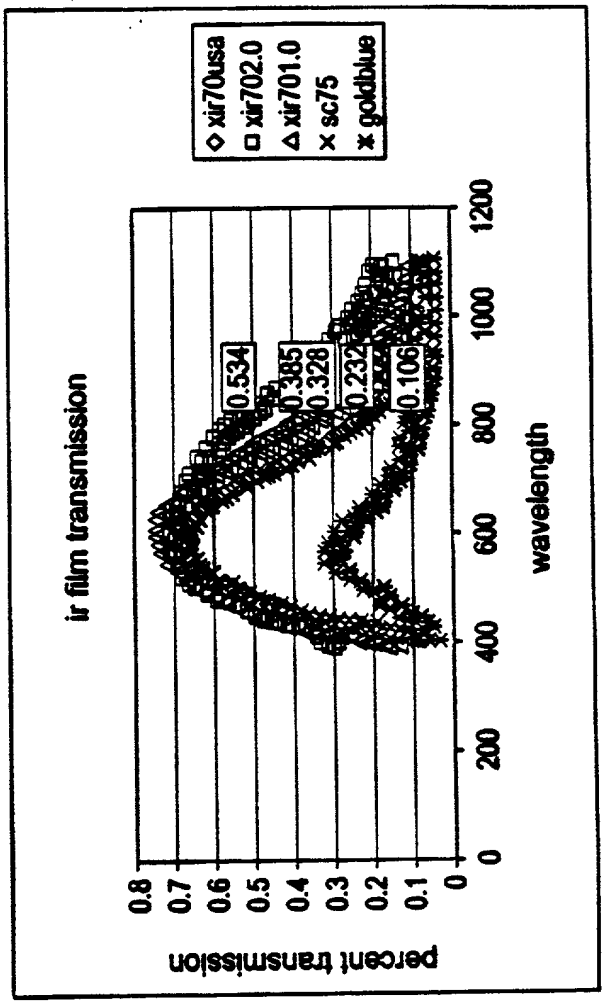

ir film transmission
percent transmission
wavelength
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0
200
400
600
800
1000
1200
◇ xir70usa
□ xir702.0
△ xir701.0
× sc75
✱ goldblue
0.534
0.385
0.328
0.232
0.106

FIG. 17H

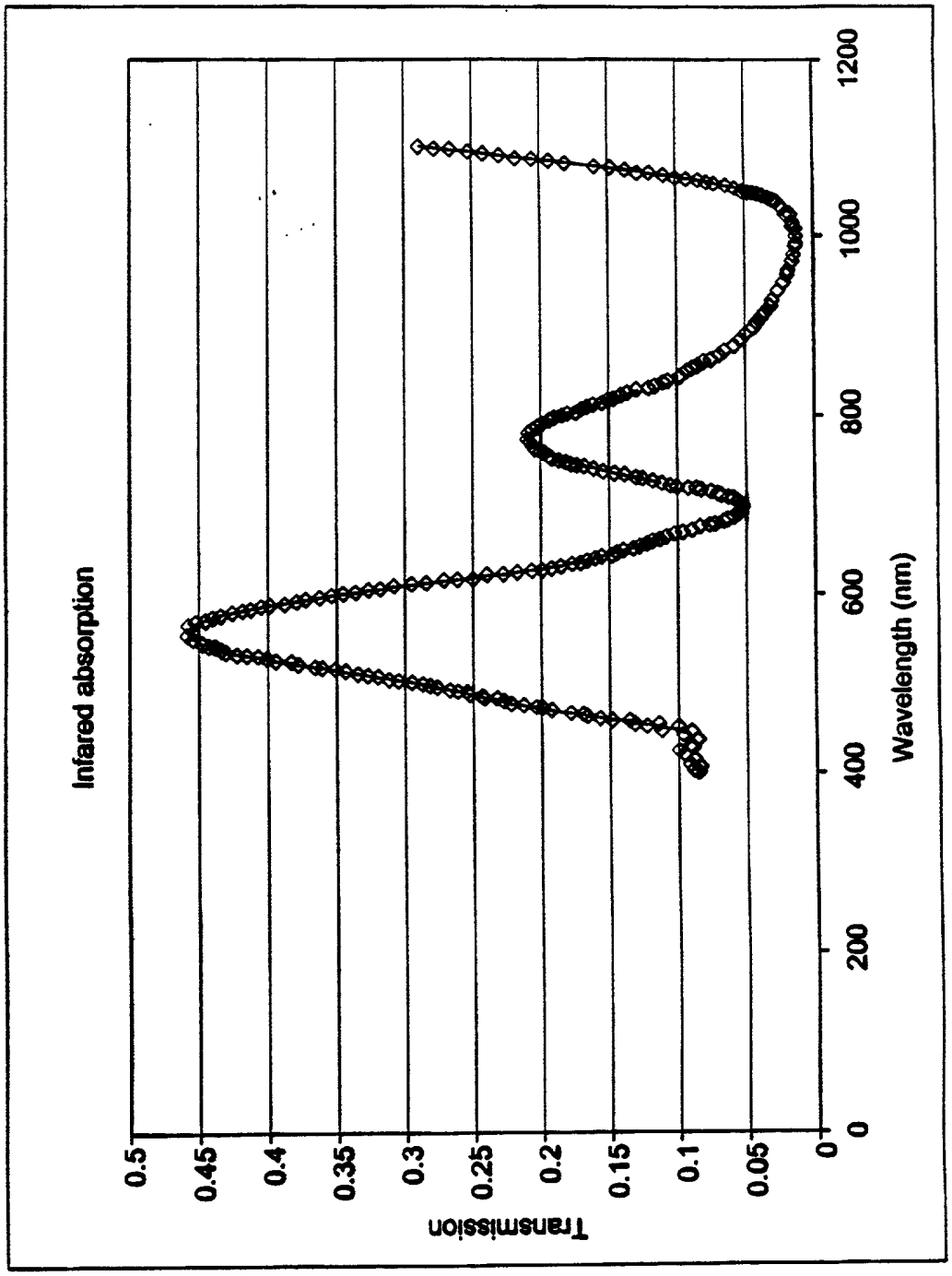

Infared absorption
Transmission
Wavelength (nm)
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
0
200
400
600
800
1000
1200

FIG. 17I